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HISTORICAL GENERATION AND FLOW OF RECYCLED URANIUM AT THE SAVANNAH RIVER SITE

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Savannah River Site (SRS) Recycled Uranium Mass Balance Project Report

Executive Summary

This report was produced in response to Deputy Secretary of Energy, T. J. Glauthier's memo of 9/15/99, Paducah Gaseous Diffusion Plant—Follow-up Activities. This memo directed the DOE Office of Environment, Safety, and Health to coordinate a project to determine whether radioactive fission products and transuranics were present in the recycle uranium streams in sufficient concentrations to represent a potential health or environmental concern. This report supports the Project Plan developed by the Office of Environment, Safety, and Health titled "Historical Generation and Flow of Recycled Uranium in the DOE Complex", dated February 2000.

Uranium flows at SRS involved three primary process areas:

1. Fuel and Target Fabrication Facilities in 300-Area;

2. Fuel and Target Irradiation Facilities in 100-Area;

3. Radio-Chemical Separation Facilities in the 200-Area.

Operations in 300-Area and in 200-Area were the major focus of this study as those operations presented the greatest potential for personnel exposure to fission products and transuranics in the recycle uranium stream.

Over the years of site operation, beginning with the startup of Fuel and Target Fabrication activities in 1952, employees of SRS have handled and processed uranium in support of the site's mission to produce Tritium and Plutonium for the nation's nuclear weapons program. Results of this study indicates that the site shipped 31,355.3 metric tons (MTUs) of uranium and received 54,544 MTUs of uranium from plant startup through March 1999. Figure 1-1 shows the major sources, quantities, and types of uranium material received at SRS, while Figure 1-2 provides similar information for uranium shipped from SRS. Works Technical Reports indicate that SRS first began receiving recycled uranium in 1961 in response to an increased need for plutonium-238 production. Data indicates that the Recycle Uranium Program proceeded only after careful testing and monitoring confirmed that personnel exposures from recycle uranium would not be significantly greater than that received from normal uranium operations [1]. These tests revealed that personnel exposure doses from fission products and transuranics present in the recycled uranium would be less than 10% of the dose workers received from virgin uranium, and that no additional personnel monitoring beyond that in place for virgin uranium was warranted.

Recent site studies of worker internal dose that could be received from SRS waste streams containing the maximum concentrations of impurities in uranium confirms the validity of early tests. The study conducted by Dr. Kenneth Crase and Thomas R. La Bone concludes that for fission products and transuranics present in the SRS recycle uranium waste stream, no single radionuclide contributed as much as 10% of the total internal dose from all radionuclides, including uranium [15].

The site has maintained an active bioassay program for uranium workers since plant operations began. Likewise, radiation protection measures designed to protect workers from unnecessary

radiation exposure were in place prior to plant startup and have remained in place. No evidence was found during the course of this study, which would indicate SRS recycled uranium operations presented any unusual challenge to radiological protection measures historically used at the site. These protection measures notwithstanding, records indicate that 99 workers received internal doses of uranium over the history of the plant, which are well documented in site incident reports. It is likely that the workers receiving internal uptakes of uranium were also exposed to transuranics present in the uranium at very low levels. The study indicates that SRS personnel took reasonable care in the conduct of recycle uranium operations to safeguard the health and safety of site workers, and the public, as well as, protecting the environment.

FIGURE 1-1
SRS URANIUM RECEIPTS (MTUs)